

SHOBHIT NIRWAN's
DESIGNED



ACIDS, BASES AND SALTS

NEW NOTES FOR CLASS 10 2022 EXAMS

**Including PYQs in MCQ Format
NCERT Activities
Flowchart**

Indicators

Indicators is a 'Dye' that change their colour or odour when added into an acidic or alkali solution(Alkali- a water soluble Base). Basically tell us whether a substance is acidic or basic.

There are basically 3 types of Indicators:

- **Natural Indicators:** These indicators are found in nature in the plants
eg:- Litmus Paper, Turmeric
- **Synthetic Indicators:** The indicators which are synthesised in the laboratory or industry are known as synthetic indicators. eg:- phenolphthalein and methyl orange
- **Olfactory Indicators:** Substances whose odour (smell) change in acidic or basic medium eg:- vanilla, onion, clove

	RED LITMUS PAPER	BLUE LITMUS PAPER	TURMERIC	PHENOLPHTHALEIN SOLUTION	METHYL ORANGE SOLUTION
ACID	No change	Red	Yellow	Colourless	Red
BASE	Blue	No change	Red	Pink	Yellow



Kuch Kaam Ki Baat (K³B) :

q. What is universal indicator ?

- Acid base indicator is called universal indicator.
- It is a pH indicator made of C solution of several compounds that exhibit several smooth colour changes over a wide range pH value
- It indicate the acidity or alkalinity of solutions.

A. ACIDS

Chemical substances which turns blue litmus to red. And is having sour taste (Ex- raw mango, raw grapes, lemon, orange, and tamarind (imli), etc.)

Organic Acids and Mineral Acids

ORGANIC ACIDS(Weak Acids)

- The acids present in plant materials and animals are called organic acids.
- Some organic acids Acetic acid, lactic acid, citric acid, Tartaric acid oxalic Acid and formic acid.

ORGANIC ACID

Acetic acid	---
Citric acid	---
Lactic acid	---
Tartaric acid	---
Oxalic acid	---
Formic acid(Methanoic acid)	---

NATURAL ACID

Vinegar (Sirka)
Citrus Fruit
Sour milk or curd
Tamarind and grapes
Tomato
Ant sting and Needle leaf sting

MINERAL ACIDS (Strong acids)

- The acids prepared from the minerals of the earth. These are man made acids.
- Common acids- Hydrochloric acid, sulphuric acid, Nitric acids and carbonic acids. (weak acid)

Concentrated and Dilute Acids

ORGANIC ACIDS(Weak Acids)

- A concentrated acid which contains the minimum possible amount of water in it. " concentration of acid is decreased by adding more water"
- A dilute acid is one which contains much more of water in it.
- When concentrated acid is added to water then dilute acid is formed.



Kuch Kaam Ki Baat (K³B) :

While diluting an acid, it is recommended that the acids should be added to water and not water to the acid.

- The process of mixing conc. acid with water is highly exothermic process (Heat producing).
- So when a conc. acid and water are mixed together a large amount of (Heat) is evolved.
- This heat changes some of the water to steam explosively which can splash the acid on our face or clothes and cause acid burns.
- Even glass container may break due to excessive heating

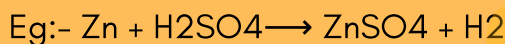
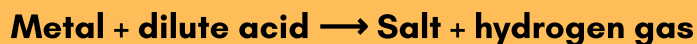
o All dilute acids conduct electricity.

* Acids :-	Sulphuric acid	→ H_2SO_4	[2 H ⁺]	[SO ₄ ²⁻]
	Nitric acid	→ HNO_3	[H ⁺]	[NO ₃ ⁻]
# Rattlo	Hydrochloric acid	→ HCl	[H ⁺]	[Cl ⁻]
	Carbonic acid	→ H_2CO_3	[2 H ⁺]	[CO ₃ ²⁻]
	Acetic acid	→ CH_3COOH	[H ⁺]	[CH ₃ COO ⁻]

The positive ion of all acids are same (H⁺) which is responsible for Acidic properties

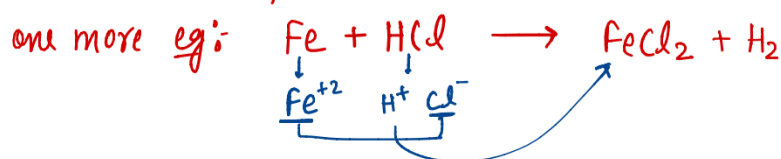
Chemical Properties of Acids

Reaction with Metals



- Most of the acids react with metal to form salt and evolve H_2 gas.
- As we see that acids react with the metal to form poisonous salt therefore we do not keep curd or sour eatables in brass or copper metals

Trick: Acid के \ominus ve part को metal के साथ जोड़ दो to form salt.



NCERT ACTIVITY (AASAN BHASHA MEI)

1 Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning

Activity 2.3

CAUTION: This activity needs the teacher's assistance.

- Set the apparatus as shown in Fig. 2.1.
- Take about 5 mL of dilute sulphuric acid in a test tube and add a few pieces of zinc granules to it.
- What do you observe on the surface of zinc granules?
- Pass the gas being evolved through the soap solution.
- Why are bubbles formed in the soap solution?
- Take a burning candle near a gas filled bubble.
- What do you observe?
- Repeat this Activity with some more acids like HCl , HNO_3 and CH_3COOH .
- Are the observations in all the cases the same or different?

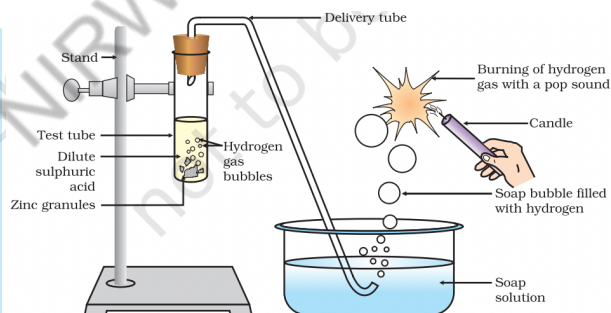


Figure 2.1 Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- Take a few pieces of zinc granules in a boiling tube and add about 5 mL of dilute sulphuric acid to it .
- We will observe the formation of gas bubbles on the surface of zinc granules.
- Pass the gas being formed through the soap solution taken in a trough (by means of a glass delivery tube). Gas filled bubbles are formed in the soap solution which rise into the air.
- Bring a burning candle near a gas-filled soap bubble. The gas present in soap bubble burns with a 'pop' sound (making a little explosion).
- Only hydrogen gas burns making a 'pop' sound. This shows that hydrogen gas is evolved in the reaction of dilute sulphuric acid with zinc metal (taken in the form of zinc granules)

Reaction with Metals Carbonate and Metal Hydrogencarbonate

Metal carbonate/ metal hydrogen carbonate + acid \rightarrow salt + CO₂ + H₂O

eg: - $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$

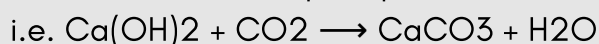
eg:- $\text{Na}_2\text{CO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow 2\text{NaCl}(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

The CO₂ (Carbon dioxide) gas is formed with Brisk effervescence.

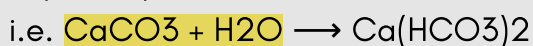


Kuch Kaam Ki Baat (K³B) : TEST for CO₂ gas

When CO₂ gas is passed through lime water (Ca(OH)₂), it turns milky due to the formation of the white precipitate of CaCO₃.



But if CO₂ is passed in excess, milkiness disappeared due to the formation of Ca(HCO₃)₂ which is soluble in water



NCERT ACTIVITY

(AASAN BHASHA MEI)

TEST for CO₂ gas

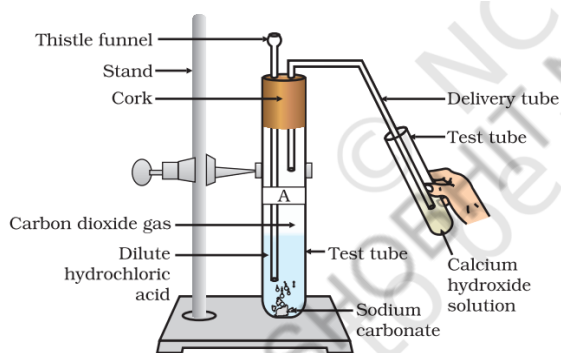


Figure 2.2
Passing carbon dioxide gas through calcium hydroxide

Activity 2.5

- Take two test tubes, label them as A and B.
- Take about 0.5 g of sodium carbonate (Na₂CO₃) in test tube A and about 0.5 g of sodium hydrogencarbonate (NaHCO₃) in test tube B.
- Add about 2 mL of dilute HCl to both the test tubes.
- What do you observe?
- Pass the gas produced in each case through lime water (calcium hydroxide solution) as shown in Fig. 2.2 and record your observations.

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- Take a boiling tube and put about 0.5 g of sodium carbonate in it.
- Add about 2 mL of dilute hydrochloric acid in the boiling tube (through a thistle funnel)
- We will observe that brisk effervescence of a gas is produced.
- Pass the gas through lime water. The lime water turns milky (showing that it is carbon dioxide gas).
- Keep on passing carbon dioxide gas through milky lime water for some more time. The lime water becomes clear again.

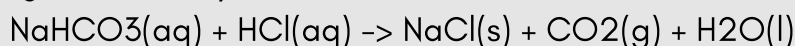
This shows that the white precipitate of calcium carbonate dissolves on passing excess of carbon dioxide gas. We can repeat this experiment by using sodium hydrogencarbonate in place of sodium carbonate. Again we will get carbon dioxide gas which will turn lime water milky. On passing excess of carbon dioxide, the milky lime water will become clear again.



Kuch Kaam Ki Baat (K³B) :

If someone is suffering from the problem of acidity after over eating then it is recommended to take baking soda as remedy.

This is because baking soda i.e. sodium hydrogen carbonate which reacts with excess hydrochloric acid in the stomach and neutralises it. This gives relief to the person suffering from acidity.



Sodium Hydrogen carbonate Hydrochloric acid Sodium chloride

Carbon dioxide gas is used to extinguish fire.

It is because carbon dioxide does not support combustion, when sprayed on a burning object it stops the supply of oxygen and extinguishes fire.



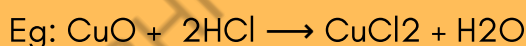
L.P. A solution reacts with crushed eggshells to give a gas that turns lime water milky. The solution contains?

A. NaCl B. HCl C. KCl D. LiCl

Solution : The eggshells are made up of calcium carbonate and a gas which turns lime water milky is carbon dioxide. Carbon dioxide gas can be formed by the action of an acid solution on calcium carbonate. So, the solution contains HCl. (Option B)

Reaction with Metals Oxides

metal oxide + acid → salt + water



This reaction shows the basic nature of metal oxides.



Kuch Kaam Ki Baat (K B) :

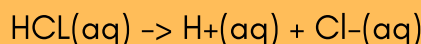
Acids are never stored in metal containers

Acids have a corrosive nature, so they gradually corrode the metal container.

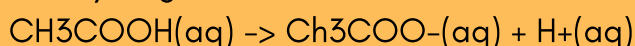
So, acids should always be stored in containers made up of glass and ceramics because they are not attacked by acids.

What do all Acids have in common?

- A common thing in all the acids is that they produce hydrogen ions [H⁺ ions] when dissolved in water.
- Acidic behaviour of an acid solution is due to the presence of hydrogen ions in it.
- Hydrochloric acid (HCl) shows acidic character because it ionises in an aqueous solution to produce hydrogen ions.



- Acetic acid (CH₃COOH) shows acidic character because it ionises in an aqueous solution to produce hydrogen ions.



- Sulphuric acid (H_2SO_4) shows acidic character because it ionises in aq solution to give hydrogen ions.
- $$\text{H}_2\text{SO}_4(\text{aq}) \rightarrow 2\text{H}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$$



Kuch Kaam Ki Baat (K^3B) :

All acids contains hydrogen but all the hydrogen containing compounds are not acids.

Ex: Aq solution of glucose and alcohol does not show acidic behaviour because yes it is true they contains hydrogen but their hydrogen does not separate out as H^+ ions on dissolving into water.

Lets do an activity to understand it further:

NCERT ACTIVITY (AASAN BHASHA MEI)

Activity to investigate whether all compounds containing hydrogen are acidic.

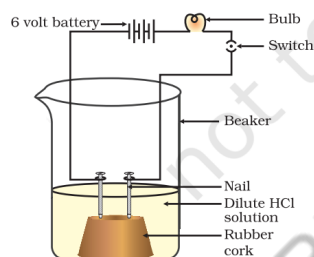


Figure 2.3
Acid solution in water
conducts electricity

Activity 2.8

- Take solutions of glucose, alcohol, hydrochloric acid, sulphuric acid, etc.
- Fix two nails on a cork, and place the cork in a 100 mL beaker.
- Connect the nails to the two terminals of a 6 volt battery through a bulb and a switch, as shown in Fig. 2.3.
- Now pour some dilute HCl in the beaker and switch on the current.
- Repeat with dilute sulphuric acid.
- What do you observe?
- Repeat the experiment separately with glucose and alcohol solutions. What do you observe now?
- Does the bulb glow in all cases?

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

(i) Take solutions of hydrochloric acid, sulphuric acid, glucose and alcohol. All these are hydrogen containing compounds.

(ii) Fix two iron nails on a rubber cork and place the cork in a beaker. (Fig (a) on next page)

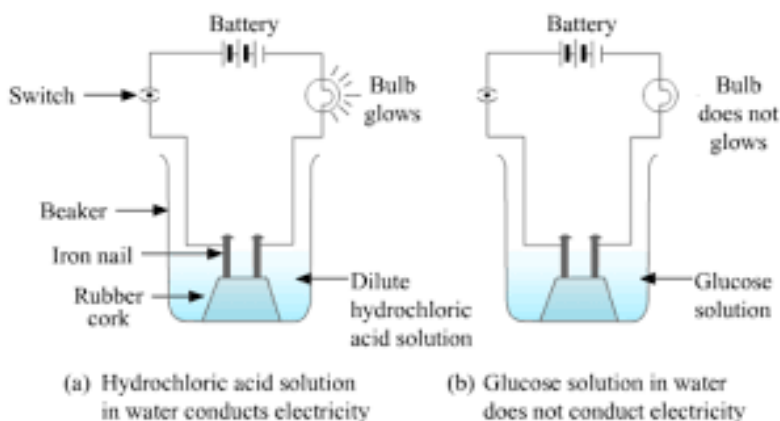
(iii) Connect the nails to the two terminals of a 6 volt battery through a switch and a bulb.

(iv) Pour some dilute hydrochloric acid solution (HCl solution) in the beaker and switch on the current. The bulb starts glowing. (Fig a)

This shows that hydrochloric acid solution taken in the beaker conducts electricity. If we repeat this experiment by taking sulphuric acid solution in the beaker, the bulb glows again. This shows that sulphuric acid solution also conducts electricity. In fact, all the acid solutions conduct electricity.

(v) Let us now take glucose solution ($\text{C}_6\text{H}_{12}\text{O}_6$ solution) in the beaker and switch on the current. The bulb does not glow in this case (Fig b). This shows that glucose solution does not conduct electricity.

If we repeat this experiment by taking alcohol solution in the beaker, the bulb does not glow again. This shows that alcohol solution also does not conduct electricity.



Hence, The aqueous solution of an acid conducts electricity due to the presence of charged particles called ions in it.

Now you will be understand these points also:

- *Distilled water does not conduct electricity* because it does not contain any ionic compound (like acids, bases or salts) dissolved in it.
- Rain water, while falling to the earth through the atmosphere, dissolves an acidic gas carbon dioxide from the air and forms carbonic acid (H_2CO_3). Carbonic acid provides hydrogen ions, $\text{H}^+(\text{aq})$, and carbonate ions, $2\text{CO}_3(\text{aq})$, to rain water. So, due to the presence of carbonic acid (which provides ions to rain water), *the rain water conducts electricity.*



Kuch Kaam Ki Baat (K^3B) :

The acidic behaviour of acids is due to the presence of hydrogen ions, $\text{H}^+(\text{aq})$ ions, in them. The acids produce hydrogen ions only in the presence of water.

So, in the absence of water, a substance will not form hydrogen ions and hence will not show its acidic behaviour.

NCERT ACTIVITY (AASAN BHASHA MEI)

Experiment to show that acids do not show acidic behaviour without water.

Activity 2.9

- Take about 1g solid NaCl in a clean and dry test tube and set up the apparatus as shown in Fig. 2.4.
- Add some concentrated sulphuric acid to the test tube.
- What do you observe? Is there a gas coming out of the delivery tube?
- Test the gas evolved successively with dry and wet blue litmus paper.
- In which case does the litmus paper change colour?
- On the basis of the above Activity, what do you infer about the acidic character of:
 - dry HCl gas
 - HCl solution?

Note to teachers: If the climate is very humid, you will have to pass the gas produced through a guard tube (drying tube) containing calcium chloride to dry the gas.

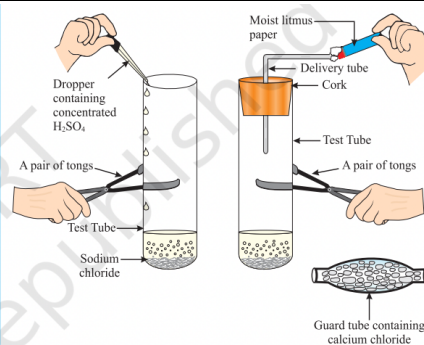


Figure 2.4 Preparation of HCl gas

Chalo Ab Ise AASAN BHASHA MEI Samajhte hai :

- Take about 1 g Solid sodium chloride (NaCl) in clean and dry boiling tube and add conc. sulphuric acid to it carefully and fit the rubber con over glass tube.
- Conc. sulphuric acid reacts with Sodium chloride to form hydrogen chloride gas. The hydrogen chloride gas starts coming out of the open enclave.
- Hold a 'dry' blue litmus paper in HCl gas. So there is no change in the colour of dry blue litmus paper. This show shows that HCl gas does not behave as an acid to the absence of water.
- We now hold a 'moist' blue litmus paper in HCl gas, Now we will see the 'moist' blue litmus paper to red. This shows that HCl gas show acidic behaviour in the presence of water.
- Conclusion: HCl gas does not shout acidic behaviour in absence of water but it shows acidic behaviour in presence of water.

B. BASES

Chemical substances which turns red litmus to blue. And is having bitter taste and soapy to touch.

Some common water soluble bases:

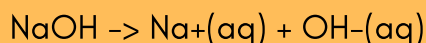
- Sodium Hydroxide (NaOH)
- Potassium Hydroxide (KOH)
- Calcium Hydroxide (CaOH₂)
- Magnesium Hydroxide(MgOH₂)

What do all Bases have in common? _____

- A base is the substance which dissolve in water to produce hydroxide ions (OH⁻ ions) in solution.

EXAMPLES:

- Sodium hydroxide(NaOH) is a base because it dissolve in water to produce OH⁻ ions.



- Potassium hydroxide is a base which dissolve in water to give OH⁻ ions.



- This presence of OH⁻ ions indicated that it has basic or alkaline properties.

Strong base and Weak Base

STRONG BASE

- A base which completely ionises in water and thus produce a large amount of (OH^-) ions is called Strong base.
- Sodium hydroxide $(NaOH)$ and potassium hydroxide (KOH) are strong base because they completely ionise on dissolving in water to produce a large amount of OH^- ions.

WEAK BASE

- A base which is partially ionised in water and produce a small amount of (OH^-) ions.
- Ammonium hydroxide $[NH_4(OH)]$, calcium hydroxide $Ca(OH)_2$, and Magnesium hydroxide $[Mg(OH)_2]$ dissolve in water to produce a small amount of OH^- ions.

Physical Properties of Bases

- Bitter in taste
- Soapy to touch
- Conduct electricity in solution
- Turns red litmus to red

Chemical Properties of Bases

Reaction with Metals

metal + base \rightarrow salt + hydrogen

Eg:- $Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$

- This is the reason why Bases को भी metal container में नहीं रखते

Reaction with Non-Metal Oxide

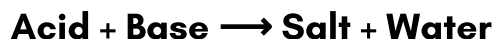
Base + non-metallic oxide \rightarrow salt + water

Eg:- $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$

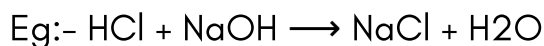
- This reaction proves that non metallic oxides are acidic in nature

C. ACID+BASE

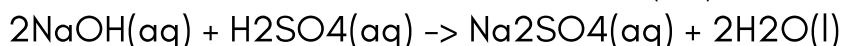
Acids react with bases to produce salt and water.



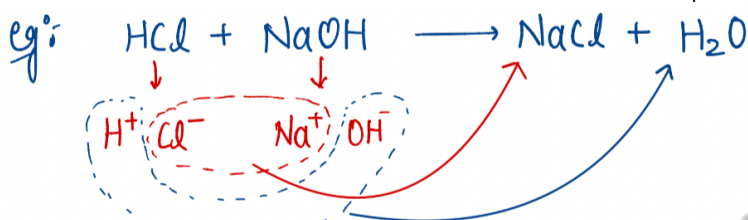
In this reaction, An acid neutralises a base; that is acid nullifies or reduces the effect of a base or vice versa the reaction is called a neutralisation reaction.



Sodium chloride(Salt)



Sodium Sulphate(Salt)

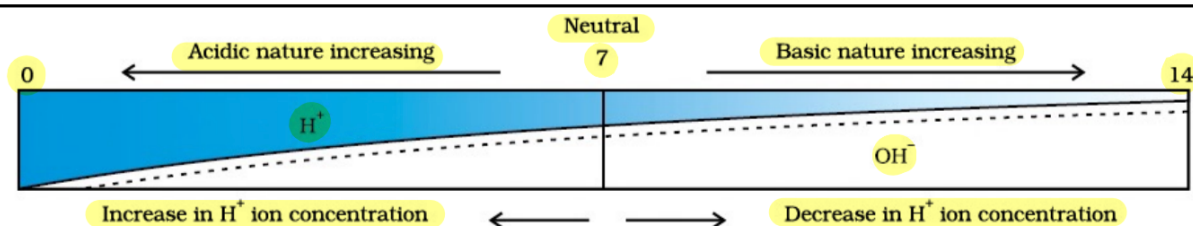


Trick: H^+ और OH^- से H_2O (पानी) बना दो और जो बच गए उसी salt



PH Scale

- Scale to measure the strength of acid or base
- It has values ranging from 0(very acidic) to 14 (very basic/alkaline).
- pH - The number which indicates the acidic or basic nature of the solution.



Kuch Kaam Ki Baat (K³B) :

IMPORTANCE OF pH IN EVERYDAY LIFE

- **Plants and animals are pH-sensitive:**

Living organisms can survive only in a narrow range of pH change, our Body works normally within a pH range of 7.0 to 7.8

When pH of rainwater goes below 5.6 it is called **acidic rain**. When acid rain flows into rivers it lowers the pH of the river water and make the survival of Aquatic life difficult

- **pH of the soil:**

Every type of plant requires a specific pH range for healthy growth. Therefore the nature of the soil is known first by testing its pH and then a particular crop is grown in it. It is suitable for selecting the fertiliser for a particular crop by knowing the pH of the soil.

- **pH in our digestive system:**

HCl is present in our stomach which helps in the digestion of food. As during indigestion in the stomach produces too much acid, it causes pain and irritation. To correct the distributed pH range, milk (a mild base) is used as a medicine, also called *Antacid* as it reduces the effect of acid or acidity.

- **pH change leads to tooth decay:**

Tooth enamel is made up of calcium phosphate and is the hardest substance in the body. If the pH inside the mouth decreases below 5.5 acidic the decay of the tooth in enamel begins.

Bacteria present in the mouth degrades the sugar and leftover food particles and produce acids that remain in the mouth after eating. The best way to prevent this is to clean the mouth after eating food. To cure tooth decay toothpaste (basic) are used which neutralise the excess acid.

- **Self-defence Plant and animals through chemical warfare:**

When insects like honeybee, ant etc bite, they eject an acid into the skin, that causes pain and irritation. If a mild base like baking soda is applied to the affected area, it gives relief.

- **pH in plants:**

Stinging hair of nettle leaves injects methanoic acid in the skin which causes burning pain.

It is cured by rubbing the affected area with the leaves of the dock plant, which often grows beside the nettle plant.



Kuch Kaam Ki Baat (K³B) :

Dilution: Mixing an acid or base with water results in a decrease in the concentration of ions per unit volume solution and acid or base is said to be diluted.

Note: The acid must always be added slowly to water with constant stirring because the process is highly exothermic. If water is added to a concentrated acid, The heat generated may cause the mixture to splash out and cause burns, the glass may also break due to excessive local heating.

D. SALTS

Found by neutralisation reaction. [Acid + Base \rightarrow Salt + Water]

Salt of strong acid and a weak base is acidic with pH value less than 7 salts so strong base and weak acid are basic in nature with pH value more than 7.

Physical Properties of Salts

- Salts are mostly solids, they have mostly high melting and boiling point
- Salts are usually soluble in water and conduct electricity.
- Salts conduct electricity due to presence of ions in them.
- Salts are ionic compounds, every salts consist positively charge ion (Cation) and negatively charge ion (Anion).
- **Family of Salts:** The salts having same positive ions are said to belong to a family of salts. Ex- Sodium Chloride(NaCl) and Sodium Sulphate(Na_2SO_4) belong to same family of salts called sodium salts(because they both contain the same positively charged ions, sodium ions Na^+)

Common salt [Sodium chloride, NaCl]

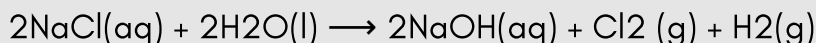
This is the salt we use in food(*Tata namak desh ka namak!*). Sea water contains many salts dissolved in it. Sodium chloride is separated from the salt deposits of solids. Deposits of solid salt are also found in several parts of the world. These large crystals are often brown due to impurities this is called rock salt. The common salt thus obtained is an important raw material for various materials of daily use such as Sodium Hydroxide, baking soda, washing soda, bleaching powder and many more.



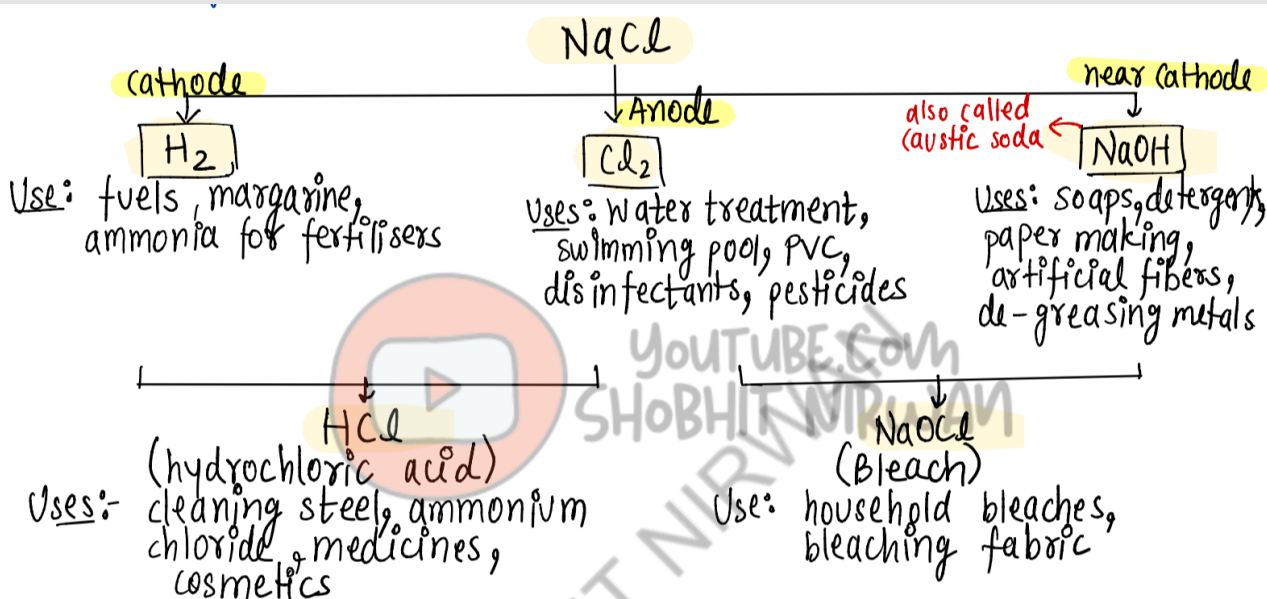
Kuch Kaam Ki Baat (K³B) :

Chlor-Alkali Process [Preparation of above materials]

When electricity is passed through an aqueous solution of sodium chloride (called brine).

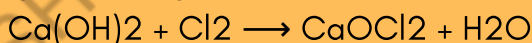


Chlorine gas is given off at the Anode and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode.



Bleaching Powder [calcium oxychloride, CaOCl₂]—

Preparation: By passing chlorine gas over slaked lime



Uses:

- For bleaching cotton textile
- For Disinfecting drinking water
- As an oxidising agent in the chemical industry
- Manufacturing chloroform

Baking Soda [Sodium hydrogen carbonate NaHCO₃]

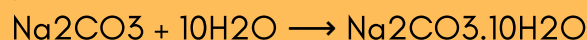
Preparation: On reacting cold concentrated calcium chloride (brine) Solution with Ammonia and carbon dioxide.

Uses:

- For making baking powder, which is a mixture of baking soda and a mild edible acid such as tartaric acid. When baking in the reaction takes place:-
- $\text{NaHCO}_3 + \text{H}^+ \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{sodium salt of acid}$
- Ingredient in antacids
- Uses in Soda-acid fire extinguisher

Washing Soda [Sodium Carbonate, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$]

Preparation: By Recrystallization of sodium carbonate in water.



Uses:

- Softening hard water
- washing clothes
- in paper, paint and textile industry
- manufacturing of sodium compounds like borax



Kuch Kaam Ki Baat (K^3B) :

What is “.10H₂O” in washing soda?

Actually, the crystals of salt appeared to be dry but actually, they are not. They contain water of crystallisation i.e. fixed number of water molecules present in one formula unit of salt

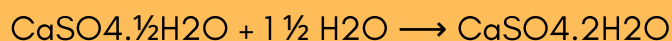
Other examples:- $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Plaster of Paris [Calcium Sulphate hemihydrate, $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$]

Preparation: Heating gypsum at 373 K, gypsum loses water molecules and becomes Plaster of Paris.



Plaster of Paris is a white powder on mixing with water it changes to gypsum giving hard solid mass.

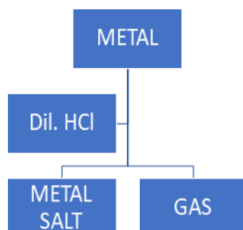


Uses:

- The doctor uses as plaster for supporting fractured bones
- making toys
- material of decoration
- Making smooth surfaces

QUESTIONS FROM CBSE SQP 2021-22

3.



Which of the following two combinations are correct?

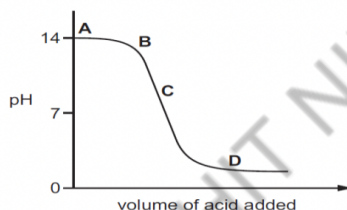
	Metal	Gas Evolved
(i)	Copper	Yes
(ii)	Iron	Yes
(iii)	Magnesium	No
(iv)	Zinc	Yes

- A. i and iii
- B. i and iv
- C. ii and iii
- D. ii and iv

Ans- D

5.

The graph given below depicts a neutralization reaction (acid + alkali \rightarrow salt + water). The pH of a solution changes as we add excess of acid to an alkali.



Which letter denotes the area of the graph where both acid and salt are present?

- A. A
- B. B
- C. C
- D. D

Ans- D

8.

Which of the given options correctly represents the *Parent acid* and *base* of Calcium Carbonate?

OPTION	PARENT ACID	PARENT BASE
A	HCl	NaOH
B	H ₂ CO ₃	Ca(OH) ₂
C	H ₃ PO ₃	CaSO ₄
D	H ₂ SO ₄	CaSO ₄

Ans- B

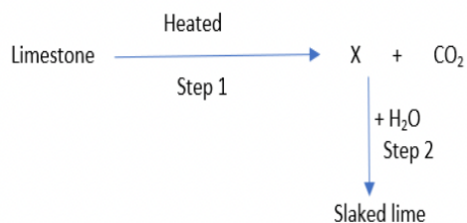
9.

How will you protect yourself from the heat generated while diluting a concentrated acid?

- A. By adding acid to water with constant stirring.
- B. By adding water to acid with constant stirring.
- C. By adding water to acid followed by base.
- D. By adding base to acid with constant stirring.

Ans- A

25.



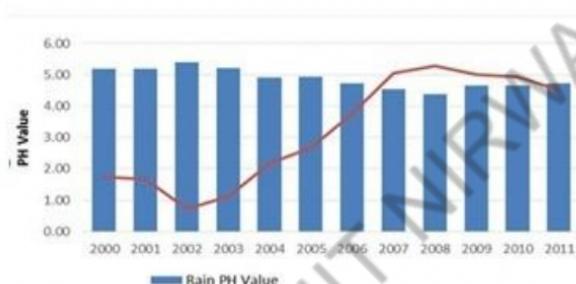
Identify the correct option from the given table which represents the type of reactions occurring in step 1 and step 2.

	endothermic	exothermic
A	x	✓
B	✓	x
C	✓	✓
D	x	x

Ans- C

26.

In which year is concentration of hydrogen ion the highest?



- A. 2002
B. 2008
C. 2011
D. 2005

Ans- A

29.

Vinay observed that the stain of curry on a white shirt becomes reddish-brown when soap is scrubbed on it, but it turns yellow again when the shirt is washed with plenty of water. What might be the reason for his observation?

- Soap is acidic in nature
- Soap is basic in nature
- Turmeric is a natural indicator which gives reddish tinge in bases
- Turmeric is a natural indicator which gives reddish tinge in acids

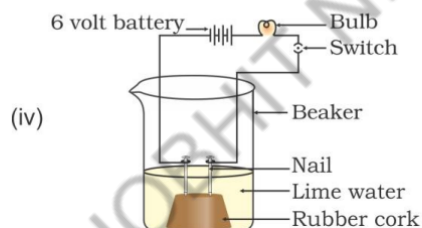
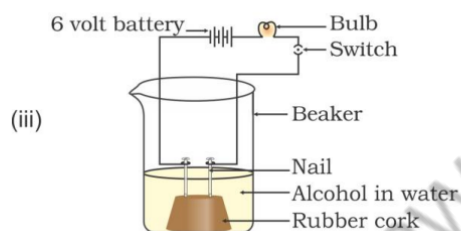
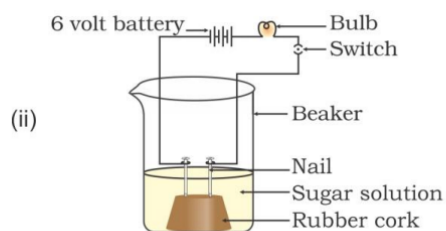
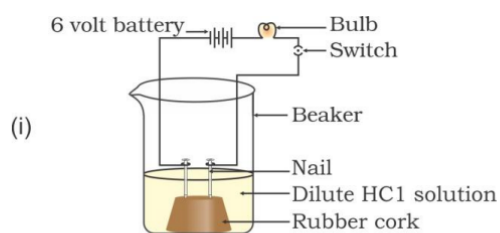
- A. i and ii
B. ii and iii
C. i and iv
D. ii and iv

Ans- B

30.

In which of the following setups would the bulb glow?

Ans- B



- A. i and ii
B. i and iv
C. ii, iii and iv
D. i, ii and iv

31.

Assertion: Fresh milk in which baking soda is added, takes a longer time to set as curd.

Reason: Baking soda decreases the pH value of fresh milk to below 6.

A is true but R is false

35.

The table given below shows the reaction of a few elements with acids and bases to evolve Hydrogen gas.

Element	Acid	Base
A	x	x
B	✓	✓
C	✓	x
D	✓	✓

Which of these elements form amphoteric oxides?

- A. A and D
B. B and D
C. A and C
D. B and D

Ans- B

Case The Salt Story

From: The New Indian Express 9 March 2021

The salt pans in Marakkanam, a port town about 120 km from Chennai are the third largest producer of salt in Tamil Nadu. Separation of salt from water is a laborious process and the salt obtained is used as raw materials for manufacture of various sodium compounds.

One such compound is Sodium hydrogen carbonate, used in baking, as an antacid and in soda acid fire extinguishers.

The table shows the mass of various compounds obtained when 1litre of sea water is evaporated

COMPOUND	FORMULA	MASS OF SOLID PRESENT /g
Sodium Chloride	NaCl	28.0
Magnesium Chloride	MgCl ₂	8.0
Magnesium Sulphate	MgSO ₄	6.0
Calcium Sulphate	CaSO ₄	2.0
Calcium Carbonate	CaCO ₃	1.0
TOTAL AMOUNT OF SALT OBTAINED		45.0

49. Which compound in the table reacts with acids to release carbon dioxide?

- A. NaCl
- B. CaSO₄
- C. CaCO₃
- D. MgSO₄

Ans- C

50. How many grams of Magnesium Sulphate are present in 135g of solid left by evaporation of sea water?

- A. 6g
- B. 12g
- C. 18g
- D. 24g

Ans- C

51. What is the saturated solution of Sodium Chloride called?

- A. Brine
- B. Lime water
- C. Slaked lime
- D. Soda water

Ans- A

52. What is the pH of the acid which is used in the formation of common salt?

- A. Between 1 to 3
- B. Between 6 to 8
- C. Between 8 to 10
- D. Between 11 to 13

Ans- A

2. A gas is evolved when Dil. Sulphuric Acid reacts with Zinc granules. It gives a pop sound when lit match stick is introduced near it. Identify the gas?

- A. Nitrogen
- B. Hydrogen
- C. Oxygen
- D. Carbon dioxide

Ans- B

5.	In the neutralization reaction when excess of acid is added to an alkali, salt and water are produced. What is the nature of the solution after the reaction occurs? A. Amphoteric B. Acidic C. Basic D. Neutral
----	--

Ans- B

27.	The reason for different behaviour (floating) of Mg in dil HCl is due to: A. Mg is lighter element than dil. HCl B. Mg reacts with dil. HCl to produce H ₂ gas which helps in floating C. Mg reacts with dil. HCl to produce N ₂ gas which helps in floating D. Mg reacts with dil. HCl to produce CO ₂ gas which helps in floating
-----	--

Ans- B

SHOBHIT NIRWAN

PREVIOUS YEAR QUESTIONS

(Converted into MCQ format)

1. Fresh milk has a pH of 6. When it changes into curd(yogurt), what will happen to its pH value? (2009)
A. Increase
B. Decrease
C. None of the above
D. Remains Constant
2. What happens when acid rain flows into the water? (2008)
A. Lowers the pH
B. Increase the pH
C. None of the above
D. Remains Constant
3. Which of the following observations is true about the dilute solution of acetic acid? (2012)
(A) It smells like vinegar and turns red litmus blue
(B) It smells like onion and turns blue litmus blue
(C) It smells like orange and turns red litmus blue
(D) It smells like vinegar and turns blue litmus red
4. A student prepared 20% sodium hydroxide solution in a beaker containing water. The observations noted by him are given below. (2013)
(I) Sodium hydroxide is in the form of pellets.
(II) It dissolves in water readily.
(III) The beaker appears cold when touched from outside.
(IV) Red litmus paper turns blue when dipped into the solution.
The correct observations are:
(A) (I), (II), and (III)
(B) (II), (III) and (IV)
(C) (III), (IV) and (I)
(D) (I), (II) and (IV)
5. In an experiment to study the properties of acetic acid, a student takes about 2 ml of acetic acid in a dry test tube. He adds about 2 ml of water to it and shakes the test tube well. He is likely to observe that: (2013)
(A) The acetic acid dissolves readily in water.
(B) The solution becomes light orange.
(C) Water floats over the surface of acetic acid.
(D) Acetic acid floats over the surface of water.
6. A student adds 4 ml of acetic to a test tube containing 4 ml of distilled water. He then shakes the test tube and leaves it to settle. After about 10 minutes he observes:
(A) A layer of water over the layer of acetic acid
(B) A layer of acetic acid over the layer of water
(C) A precipitate settling at the bottom of the test tube
(D) A clear colourless solution
7. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal [1M, 2017]
A. Hydrogen
B. Oxygen
C. Sulphur
D. None of the above

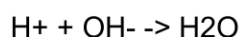
8. Which is a stronger acid (i) with pH=5 or (ii) pH=2? (2010)
A. i B. ii

9. Why does tooth decay start when pH of mouth is lower than 5.5? [1M, 2010]

Ans- When the pH in the mouth falls below 5.5, tooth decay starts. Bacteria present in the mouth produce acid by degradation of sugar and food particles which remain in the mouth after eating. The acid produced in the mouth attacks the enamel thereby, creating tooth decay.

10. How is the concentration of hydronium ions affected when an acid is diluted?

Ans- The concentration of hydronium ions decreases when an acid is diluted because on adding water the H^+ ions of the acid and hydroxyl ions of water react to form water molecules and the concentration of hydronium ions decreases.



11. Baking soda is a mixture of : (2020)

- (a) Sodium carbonate and acetic acid
- (b) Sodium carbonate and tartaric acid
- (c) Sodium hydrogen carbonate and tartaric acid
- (d) Sodium hydrogen carbonate and acetic acid

12. The chemical formula of Plaster of Paris is:

- (a) $CaSO_4 \cdot 2H_2O$
- (b) $CaSO_4 \cdot H_2O$
- (c) $CaSO_4 \cdot \frac{1}{2}H_2O$
- (d) $2CaSO_4 \cdot 2H_2O$

13. A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound. (2009)

- A. $CaSO_4 \cdot \frac{1}{2}H_2O$ B. $CaSO_4 \cdot 2H_2O$
- C. $CaSO_4 \cdot \frac{1}{2}H_2O$ D. None of the above

14. What is observed when 2 mL of dilute hydrochloric acid is added to 1 g of sodium carbonate taken in a clean and dry test tube? Write a chemical equation for the reaction involved. [2M, 2019]

Ans- When 2 mL of dilute HCl is added to 1 g of sodium carbonate, CO_2 is evolved with brisk effervescence along with the formation of water and sodium chloride salt.

15. Blue litmus solution is added to two test tubes A and B containing diluted HCl and NaOH solution respectively. In which test tube a colour change will be observed?

- A. Test tube B B. Test tube A
- C. Both test tubes D. None of the test tubes

16. Write the chemical formula for washing soda. How may it be obtained from baking soda? Name an industrial use of washing soda other than washing clothes.

[2M, 2008]

Ans- Washing soda $Na_2CO_3 \cdot 10H_2O$

Steps :



17. What is alkali? Give an example. [2M, 2008]

Ans- Bases that are soluble in water are called Alkalis. all alkalis are bases but all bases are not Alkalis.

Ex : Sodium hydroxide, Potassium hydroxide, etc .

18. Write one word/term for the following:

(i) Water soluble base

(ii) A substance which dissociates on dissolving in water to produce hydrogen ions.

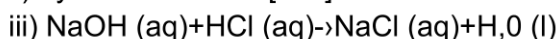
$[\text{H}^+(\text{aq})]$ ions)

(iii) A reaction between an acid and a base to form salt and water

(iv) A substance which dissociates on dissolving in water to produce hydroxide ions (OH^- ions) [2M, 2016]

Ans- i) alkali

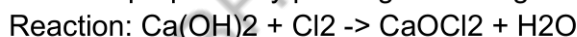
ii) hydrochloric acid $[\text{HCl}]$



iv) Sodium Hydroxide(NaOH)

19. Write the chemical formula for bleaching powder. How is bleaching powder prepared? For what purpose is it used in paper factories? [2M, 2008]

Ans- The chemical name of bleaching powder is calcium oxychloride and its chemical formula is CaOCl_2 . It is prepared by passing chlorine gas through dry slaked lime.



It is used :

(i) as a disinfectant and germicide especially in the sterilization of drinking water.

(ii) for manufacture of chloroform.

20. What is the chemical formula for Plaster of Paris? How is it prepared? State the common and chemical names of the compound formed when Plaster of Paris is mixed with water. [2M, 2008]

Ans- The chemical formula of this compound is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ (Calcium sulphate hemihydrate)

It is prepared by heating gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at 300 degree celcius.



21. Identify the acid from which sodium chloride is obtained? (2019)

A. H_2SO_4

B. HCl

C. HNO_3

D. None of the above

22. Identify the Base from which sodium chloride is obtained? (2019)

A. KOH

B. $\text{Ca}(\text{OH})_2$

C. NaOH

D. None of the above

23. Which type of salt is Sodium chloride? (2019)

Ans. Rock salt

24. 2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid.

- A. H₂ gas
B. Sulphur gas
C. O₂ gas
D. None of the above

25. The pH of a salt used to make tasty and crispy pakoras is 9. Identify the salt and write a chemical equation for its formation. List its two uses. [3M, 2018]

Ans- The pH of salt used to make tasty and crispy pakoras is 9.

The baking soda is most commonly used in making tasty pakoras because it's basic in nature. It's chemically known by the name sodium bicarbonate.

The reaction that takes place during cooking of food and adding baking soda in it is as follows:



NaHCO₃ - Sodium bicarbonate

Na₂CO₃ - Sodium carbonate

H₂O - Water

Uses of Baking Soda are:

- Acts as an antacid which is used to treat stomach upset and indigestion
- Due to the formation of soapy foam, it is used in fire extinguishers

26. What are the products of the chlor-alkali process? (2020)

- A. NaOH
B. Cl₂
C. H₂
D. all of the above

27. State reason for the following statements:

- (i) Tap water conducts electricity whereas distilled water does not.
(ii) Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.
(iii) During the summer season, a milkman usually adds a very small amount of baking soda to fresh milk.
(iv) For a dilution of acid, acid is added into water and not water into acid.
(v) Ammonia is a base but does not contain hydroxyl groups. [5M, 2015]

Ans-

- (i) Tap water contains ions which conduct electricity, distilled water does not contain ions.
(ii) Dry HCl does not form ions but HCl gives H⁺ and Cl⁻.
(iii) Baking soda does not allow milk to change to lactic acid which makes milk sour.
(iv) Adding water to acid is highly exothermic. Therefore water is added to acid very slowly with cooling.
(v) Ammonia dissolves in water and forms OH⁻. Therefore, it is basic in nature.

28. Equal lengths of magnesium ribbon are taken in two test tubes 'A' and 'B'. H_2SO_4 is added to test tube 'A' and H_2CO_3 in the test tube 'B' in equal amounts: (2013)

(I) Identify the test tube showing a vigorous reaction.

- A. test tube A
B. test tube B
C. Both test tube
D. none of the above

(II) Give reason to support your answer.

Ans- Because H_2SO_4 is strong acid

(III) Name the gas liberated in both the tubes. How will you prove its liberation?

- A. H_2
B. O_2
C. SO_2
D. none of the above

(e) Out of the two acids taken above

(i) Which one will have a lower pH value?

Ans -A

(ii) lower H^+ concentration respectively.

Ans- B

29. (a) Importance of pH in everyday life ? ---- ans in notes (2017)

(b) How are sodium hydroxide and Cl_2 gas produced from common salt. What is the process called? ---- chlor-alkali process(explained in notes)

PYQ MCQ ANSWERS:

- 1.b
- 2.a
- 3.d
- 4.d
- 5.a
- 6.d
- 7.a
- 8.a
- 9.
- 10.
- 11.c
- 12.c
- 13.a
- 14.
- 15.b
- 16.
- 17.
- 18.
- 19.
- 20.
21. b
22. c
- 23
- 24 a
- 25
26. d
- 27
28. I- a, II- ,III-a